

Model Question Paper
Probability Distributions - Part I

12th Standard

Business Maths

Reg.No. :

I. Answer all the questions.

II. Use blue pen only.

III. Question number 15 is compulsory.

Time : 01:30:00 Hrs

Total Marks : 85

5 x 1 = 5

Part-A

- 1) If a fair coin is tossed three times the probability function $p(x)$ of the number of heads x is

(a)

x	0	1	2	3
p(x)	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{2}{8}$	$\frac{3}{8}$

(b)

x	0	1	2	3
p(x)	$\frac{1}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{8}$

(c)

x	0	1	2	3
p(x)	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{2}{8}$	$\frac{3}{8}$

(d) none of these

- 2) If a discrete random variable has the probability mass function as

x	0	1	2	3
p(x)	k	2k	3k	5k

then the value of k is

- (a) $\frac{1}{11}$ (b) $\frac{2}{11}$ (c) $\frac{3}{11}$ (d) $\frac{4}{11}$

- 3) If the probability density function of a variable X is defined as $f(x) = Cx(2-x)$, $0 < x < 2$ then the value of C is

- (a) $\frac{4}{3}$ (b) $\frac{6}{4}$ (c) $\frac{3}{4}$ (d) $\frac{3}{5}$

- 4) The mean and variance of a binomial distribution are

- (a) np, npq (b) pq, npq (c) np, \sqrt{npq} (d) np, npq

- 5) If $X \sim N(\mu, \sigma)$, the standard Normal variate is distributed as

- (a) $N(0, 0)$ (b) $N(1, 0)$ (c) $N(0, 1)$ (d) $N(1, 1)$

Part-B

5 x 6 = 30

- 6) A random variable X has the following probability distribution

Values of X, x :	-2	0	5
p(x) :	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{2}$

Evaluate the following probabilities (a) $p(X \leq 0)$ (b) $p(X < 0)$ (c) $p(0 \leq X \leq 10)$

- 7) A random variable X has the following probability function

Values of X, x :	0	1	2	3
p(x) :	$\frac{1}{16}$	$\frac{3}{8}$	k	$\frac{5}{16}$

(i) Find the value of k (ii) Construct the c.d.f. of X

- 8) Two unbiased dice are thrown. Find the expected value of the sum of the points thrown.

- 9) Find $E(2X-7)$ and $E(4X+5)$ for the following probability distribution.

x :	-3	-2	-1	0	1	2	3
p(x) :	.05	.1	.3	0	.3	.15	.1

- 10) The distribution of marks obtained by a group of students may be assumed to be normal with mean 50 marks and standard deviation 15 marks. Estimate the proportion of students with marks below 35.

Part-C

5 x 10 = 50

- 11) A random variable X has the following probability distribution .

Values of X, x :	0	1	2	3	4	5	6	7	8
p(x) :	a	3a	5a	7a	9a	11a	13a	15a	17a

(1) Determine the value of a (2) Find $p(x < 3)$, $p(x > 3)$ and $p(0 < x < 5)$.

- 12) Let X be a continuous random variable with p.d.f. $f(x) = \begin{cases} ax, & 0 \leq x \leq 1 \\ a, & 1 \leq x \leq 2 \\ -ax + 3a, & 2 \leq x \leq 3 \\ 0 & \text{otherwise} \end{cases}$ (i) Determine the constant a (ii) compute $p(X \leq 1.5)$

- 13) Let X be the life length of a certain type of light bulbs in hours. Determine 'a' so that the function $f(x) = \frac{a}{x^2}$, $1000 \leq x \leq 2000$ may be the probability density function.
 $= 0$ otherwise

- 14) The kms. X in thousands which car owners get with a certain kind of tyre is a random variable having p.d.f. $f(x) = \frac{1}{20}e^{-\frac{x}{20}}$, $\text{for } x > 0$ Find the probabilities that one of these tyres will last (i) atmost 10,000 kms (ii) anywhere from 16,000 to 24,000 kms (iii) atleast 30,000 kms.
 $= 0$ for $x \leq 0$

15) a) Find the mean, variance and standard deviation of the following probability distribution.

Values of x :	-3	-2	-1	0	1	2	3
Probability p(x):	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$

(OR)

b) Find the mean and variance for the following probability distribution. $f(x) = \begin{cases} 2e^{-2x}, & x \geq 0 \\ 0, & x < 0 \end{cases}$

